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TRAINING IN VISUAL PERCEPTION FOR YOUNG DEAF CHILDREN TO STIMULATE SCHOOL READINESS.

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TWENTY-TWO CHILDREN ENROLLED IN THE BEGINNING CLASSES FOR THE DEAF AT THE GOVERNOR MOREHEAD SCHOOL PARTICIPATED IN A VISUAL TRAINING PROGRAM. ONE GROUP OF 11 CHILDREN RECEIVED 20 INDIVIDUAL TRAINING SESSIONS DURING 10 WEEKS. AT THE COMPLETION OF THIS TRAINING, THE SECOND GROUP OF 11 CHILDREN RECEIVED THE SAME TRAINING PROGRAM. THE TWO GROUPS SHOWED NO SIGNIFICANT DIFFERENCES BETWEEN MEANS FOR AGE OR PERFORMANCE ON THE NEBRASKA TEST OF LEARNING APTITUDE FOR YOUNG DEAF CHILDREN AND THE PERFORMANCE SCALE OF THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN (WISC). THE PROGRAM COMPRISED 13 SEQUENCES OF ACTIVITIES INCLUDING REPRODUCING (FROM A MODEL OR A PICTURE) PATTERNS OF BLOCKS WITH VARYING COLOR CONTRAST AND IN A HORIZONTAL OR VERTICAL ARRANGEMENT, ASSEMBLING PUZZLES, MATCHING BY SHAPE, COLOR, AND/OR FOR CONFIGURATION, AND DETECTING EMBEDDED FIGURES. THE WISC AND THE NEBRASKA TEST WERE ADMINISTERED TO BOTH GROUPS BEFORE AND AFTER THEIR TRAINING PERIODS. STATISTICALLY SIGNIFICANT GAINS WERE MADE BETWEEN PRE- AND POSTTESTING. SUBTESTS WITH GREATEST GAINS WERE COLORED OBJECTS FROM THE NEBRASKA TEST AND PICTURE COMPLETION AND CODING FROM THE WISC. ALTHOUGH BOTH GROUPS SHOWED GAINS ON THE VISUAL PERCEPTION TESTS, GROUP TWO OBTAINED LOWER SCORES ON BOTH TESTS. MEANS FOR THE ENTIRE GROUP WERE CLOSE TO THE MEANS ACHIEVED BY OLDER CHILDREN WITH ONE YEAR OF SCHOOL EXPERIENCE WHO WERE ALSO TESTED. EXPERIENCED PERSONS WORKING WITH THE CHILDREN FELT THE CHILDREN USED VISUAL CUES MORE MEANINGFULLY AFTER THE TRAINING PROGRAM. INITIAL RESULTS INDICATE INCREASED ALERTNESS TO VISUAL CUES IN OBJECTIVE MEASURES WHICH SHOULD BE REFLECTED IN CLASSROOM ACHIEVEMENT. FURTHER TESTING IS PLANNED TO DETERMINE IF GAINS ARE SUSTAINED. INCLUDED ARE A 42-ITEM BIBLIOGRAPHY AND INSTRUCTIONS FOR ADMINISTERING EACH OF THE 13 TRAINING SEQUENCES. (MY)

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Mrs. Rachel F. Rawls

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TRAINING IN VISUAL PERCEPTION FOR YOUNG DEAF CHILDREN TO STIMULATE SCHOOL READINESS

In the classroom and in individual and group testing sessions, students at The Governor Morehead School division for the deaf often seemed to be unaware of visual differences. They seemed to lack perception of details in visually presented materials, and this tended to retard development of verbal skills as well as other educational development. Funds were requested through a research and demonstration grant for a specific training program for beginning students to stimulate school readiness by increasing their responsiveness to visual stimulation.

Vision constitutes the primary avenue for educational activities for deaf children, and although intake of cues from tactual, kinesthetic and other modalities is important, these cues must be interpreted primarily visually. A training program to enhance perceptual skills at several perceptual levels should be a component of any educational program for deaf children, but it was felt that this should be intensified in the beginning stages of their formal educational experiences.

THE ROLE OF VISUAL PERCEPTION IN LANGUAGE READING DEVELOPMENT

Adequate visual perceptual skills are not only essential to reading activities, but with the deaf child other areas of language development such as speech reading and oral activities of all kinds depend on these skills. Whereas, the deaf child's need for visual perception skills is demonstrably greater than his normal hearing peer, some research evidence would at least suggest that his response to visual cues is less acute than that of a hearing child of comparable age. Ideally his language training and his perception of oral activities in his environment would begin in the pre-school years, but for many congenitally deaf children this has not been the case. When it is not his early school experience must be devoted in large measure to making up as far as possible for this deficit.

Both culturally deprived children and deaf children lack verbal stimulation and tend to be at a disadvantage when compared to children with greater opportunity for perceptual development. The particular group of children with whom this study is concerned often suffer from both deprivation of aural intake and environmental lack of stimulation. Therefore, it seemed especially important to investigate means of enhancing visual awareness of the environment.

The role of visual perception in the reading process is not necessarily completely understood, nor is there general agreement as to what is involved as far as visual perception is concerned. Dr. Byerly Holt (1964) states: "...eye specialists realize that the brain, not the eye, learns to read..." (page 331). To an even greater extent this would be true of speech and speech reading. Vision is a developmental phenomenon, and visual perceptual skills are refined as the organism matures in non-visually impaired children. "Perception of light exists from birth and consequently the reflexes which insure the adaptation of this perception (the pupillary and palpebral reflexes, both to light). All the rest (perception of forms, sizes, positions, distances, prominence, etc.) is acquired through the combination of reflex activity with higher activities." (Piaget, 1952, p. 62) The infant within the first month or so of life has learned to direct his glance. Later he acquires various accommodations to distance, prominence, etc. "Still later, or concurrently, the visual images acquire meanings connected with hearing, grasping, touching, with all the sensorimotor and intellectual combinations. Thus they support increasingly subtle functions." (Piaget, 1952, p. 65)

In the literature on perception the meaning of the term may be defined differently by different authors. Gibson and Gibson (1955), for example, suggest perception consists in making discriminations and that this capacity increases with practice so that improved perceptual learning is associated with the ability to make increasingly fine discriminations. Eleanor Gibson (1965) applies this concept specifically to perception in reading. Bruner (1957) defines perception as ability to categorize and identify: "Perceiving accurately under substandard conditions consists in being able to refer stimulus inputs to appropriate coding systems where the information is fragmentary, one reads the properties of the stimulus input from the code to which part of the input has been referred." (p. 124)

Birch (1962) makes a distinction among perceptual levels which would include both concepts. He defines these as: (1) perceptual discrimination (2) perceptual analysis and (3) perceptual synthesis. To discrimination and categorization he adds the step of synthesis undoubtedly implied in other theories.

Visual perception is inexorably related to perception through the other sense modalities. Visual discrimination apparently precedes auditory discrimination in normal infants, but the input is so closely correlated from visual, auditory, tactile and kinesthetic modalities that they are interdependent. For establishment of his own efficient accommodation, the child depends on a complex of visual, auditory and kinesthetic-tactile feedback to guide him.

To read demands that a graphic symbol be associated with some kind of previously acquired language sound for the hearing child. De Hirsh (1963) defines it thus: "Reading is the successful response to the visual forms of language. The understanding of graphically fixed language units is the goal of reading." (p. 227)

Before the normal child learns to read, he has learned to speak and has acquired a relatively complex grammatical structure. Graphic symbols are thus associated by the child with previously learned sounds which already have symbolic meaning in terms of both concrete and abstract concepts for him. The child without an aural background is somewhat limited in concept formations in any event, but concrete objects if symbolized for him have been symbolized in visual terms whether in manual gestures or words formed orally but perceived visually. To a large extent the aurally impaired child's sequence is the reverse of that of the normal child, since much of what he learns to associate with oral language must first be acquired from graphic symbols.

Adequate visual perception is not entirely dependent upon the complete integrity of the end organ. Children with severe visual defects do learn to utilize visual perception in reading effectively. Certain dysfunctions do interfere with acquisition of reading skills, but the relationship is by no means clear-cut. The visual perceptual tasks and capabilities of the learning-to-read stage probably differ somewhat from those demanded in the later stages of reading. As reading becomes an effective tool, it plays an every increasing role in the process of building higher order abstract concepts, and in time may cease to demand the mediation of oral language symbols. It must be the deaf child's primary method of building abstract concepts.

Considerably more research has been done with the learning-to-read stage and the visual tasks demanded for this than with the perceptual skills involved in the later stages of reading. Most of the work done with persons having already established reading patterns and techniques has been in terms of building perceptual speed. There is, however, considerable knowledge about the role of visual perception in beginning reading.

Considerable controversy has centered around the perceptual unit which is most effective in teaching reading -- phrases, words, letters, phonemes. It is apparent, however, that both integrative and differentiating functions are required, and not every child responds to the same perceptual approach.

Eye movements and patterns of movements have been extensively studies by a number of different techniques including filming the process with good and poor readers, attaching recording devices to the eyes, blink rates, etc. Findings are tentative and interpretation of these findings vary from one experimenter to another. Binder (1955) asserts that sequential eye movements gather information, making available cues involved in perception. The selection of observation of cues is influenced by the prior set of the individual. Hendrickson (1962) states "...through the development of specific eye movement patterns the child learns to reduce action and build eye movements skills which are requisite for quick and accurate visual inspection of his world." (p. 3) Robinson (1946) in summarizing much of the then available research on fixation found relatively little clear research evidence of the function of fixations of visual perception beyond the suggestion that the number of fixations per line decreases with increasing maturity. De Hirsh (1963) suggests that faulty eye movements may occur because of problems of comprehension rather than comprehension difficulties arising from faulty eye movements.

Pratt (1950) concluded that past experience is of greater importance at the motor level of the visual-motor task of visual perception than at the sensory level. Many educators and specialists working with normal children and children with learning disorders feel that sensori-motor activity and cognition are closely associated. Montesorri (1964) proceeded on the basis that perceptual development arises from interrelated stimulation from visual, tactual and auditory senses and the motor responses to these.

Kephart (1960, 1963), Straus and Lehtinen (1947), Delacato (1961) and Ayers (1961) among others base remediation training for children with reading and language difficulties on motor oriented training and procedures. Orthoptic training and optometric training in general is primarily muscle and motor training. Reissman (1966) emphasizes the fact that so-called disadvantaged children often respond to physical stimulation: "The physical learner generally gets his muscles into his work, and this takes time." (p. 17) Montesorri (1964) felt that the child must orient himself spatially through every channel of the sensorium. Visual intake achieves meaning and becomes visual perception through motoric activities in the early stages of development.

The role of lateral dominance in visual perception is somewhat tentative, but children with dyslexia do experience problems in this area and mixed dominance is often present in these cases. Benton (1962) states that: "...these perceptual and directional factors are more

important in the early learning of reading than in the persistent dyslexia which is of primary interest to the clinician." This implies that established laterality in the young child beginning to read would facilitate the acquisition of skills, but that it plays a lesser role later. Visual perceptual training for a beginning reader might, however, justifiably include some emphasis on left to right sequencing, up and down patterning, etc.

Frostig, Lefever and Whittlesey (1961), and Frostig (1961, 1963) isolated five perceptual areas for which both tests and developmental programs were constructed. These were: (1) eye-motor coordination, (2) figure-ground perception, (3) form constancy, (4) position in space and (5) spatial relations. Kirk and McCarthy (1961) in developing the Illinois Test of Psycholinquistic Abilities included such visual perception tests as visual-decoding, visual-motor sequential, visual-motor association and motor encoding.

VISUAL PERCEPTION TRAINING

Among the early visual perception training programs, as previously mentioned, was that of Montesorri. Transferring to her work with what would now be termed "culturally disadvantaged children" from her prior experience with retarded children, she incorporated a number of carefully planned steps teaching concepts and refining discriminations in a graduated sequence. In general her program introduced materials first that varied only in one dimension. For example, the rods were graduated in length but color and thickness remained constant. From single discriminations the child progresses to more complex stimulus materials that vary along two or more dimensions at once. Verbal instruction is kept minimal and the instructor demonstrates. Verbal labels are attached as the child becomes ready.

Other visual perception training programs, such as those of Kephart (1960, 1963) and Delacato (1959) stress gross motor activity generally attempting to follow what they conceive as normal ontogenic development. Monroe (1951) says that all children can profit from activities that bring about better eye control at reading distance, accurate discrimination of size, color, shape, contour, position, and other internal details; and cause eyes to move from left-to-right. Adler (1964) in discussing the child who is non-verbal suggests that these children often need spatial discrimination training, figure-ground exercises, etc. Jolles (1958) in work with educably mentally retarded, brain injured and perceptually immature children developed a program that followed the following sequential order: (1) recognition of basic forms, (2) form discrimination

and (3) perceptual organization employing puzzles, parquetry blocks, words, etc. Other programs have employed tachistoscopic training (Renshaw, 1940; Goins, 1958; Eames, 1959).

Chansky (1965) and Chansky and Taylor (1963, 1964) in three studies using similar methodology in each employed a training program emphasizing corrective feedback, left to right orientation, veridical identification of symbols, correct organization of time sequence and induction of a response in the absence of a visible cue. These studies were done with retardates, underachievers and with pupils in regular third grades in predominantly white and predominantly Negro schools. With underachievers, gains were displayed in achievement; with retardates, there was improvement in performance on intelligence tests. The last group experienced several different variations in treatment and analysis indicated interaction with sex and race for different treatment methods. A large portion of the basic design for the present project evolved from a study of the methods and materials employed in the Chansky research, though it was necessary to make a number of adaptations since the materials were too difficult for the younger children in the group under consideration.

There is a considerable body of evidence that more efficient visual perception can be learned and more effective use of visual skills attained through training both among children with no apparent perceptual difficulties and with children having learning problems and/or perceptual deficits. With children having perceptual deficits, the diagnosed anomalies would dictate the nature of the training needed.

IMPLICATIONS FOR PROGRAMS FOR CONGENITALLY DEAF OR EARLY DEAF CHILDREN

"While experience is experience of the living of the organism, and is total rather than local or partial in character, it is primarily the experience of particular events impinging upon one or more of the zones of interaction, which are end stations of the living organism. ..if because of a misfortune in genetic constitution, or an injury or misfortune in development, a creature is born with an unusual defect, or comes to suffer the destruction of part of the apparatus of a zone of interaction with the necessary equipment, than quite frequently other apparatus can be modified--chiefly the educator apparatus, the central nervous system. And so the zone of interaction, defined from the standpoint of that which impinges upon it, becomes functional again, although the biological apparatus, the histological apparatus, if you please is very different." (Sullivan, 1953, p. 60).

Research evidence concerning the visual perception of congenitally deaf and other very early deaf children is quite contradictory and inconclusive. Very little can be found in the literature that seems to be related to specific visual perception skills directly involved in reading. Many of the variables such as level of ability, age at onset, preschool experiences, etiology of deafness, etc. are difficult to control at one time.

Mangum (1963) summarizes a number of studies relating to the perceptual capacities of deaf children including the ones discussed below. Mykelbust and Brutten found that the deaf population performed less efficiently on tests of visual perception than the hearing control group. A. L. Larr found contrary evidence, but his test battery was entirely different. Both studies found the deaf population inferior in conceptualization. The Mykebust and Brutten research employed tests of figure-ground, pattern reproduction and perseveration. Some of the literature uses the term perception to include what other researchers call conception. Hughes found deaf children knew the meanings of 163 out of 241 percept words, but could sort only 46 into categories whereas normally hearing children were significantly superior in the task. Doehring and Rosenstein found the young deaf group less accurate than hearing controls in tests of visual recognition of single letters, trigrams and four letter words of differing frequencies. Mangum (1963) concludes: "The verbal behavior of the deaf was more perceptual than conceptual."

Di Carlo (1964) outlines some current concepts concerning the perceptual capacity of deaf children and takes issue with Mykelbust's thesis that all sensory input is necessarily affected or restricted by hearing loss. He stresses need for additional research on this. Certainly specialists in language development who think that visual perception is strengthened by attaching verbal labels must conclude that the deaf child is at a disadvantage in this regard.

The young deaf child can organize his perceptions of the environment and form concepts without language, but he may experience more difficulty in storing information. He has only one available distance sense, vision. Mykelbust (1954) summarizes some of the functions vision must serve for the child with impaired hearing: (1) It must serve both foreground and background functions. The child must scan the background as well as use vision in the immediate foreground. (2) He must use vision exploratorily. He becomes quite sensitive to movement, including light and shadow as he seeks to understand the environment. (3) He watches facial expressions of those around him as he perceives cues to the environmental influences he is experiencing.

Indications that deaf children living at home tend to perform better in speech, speech reading and tests of educational achievement than residential pupils attending the same school as found by Quigley and Frisina (1961) suggest that visual perception of Language is sharpened in a language environment. In this same study deaf children with deaf parents achieved better in finger spelling and speech reading, though not in speech. Peter (1965) states that by organizing and centering adequate modes of seeing, motion and feeling, the deaf child can progress well but the early development is slower.

THE VISUAL PERCEPTION TRAINING PROGRAM

The present study was planned with two important considerations in mind. Observation of beginning pupils in the deaf department both in classroom and testing situations indicated that many entering children apparently had perceptual deficits. Review of research on perceptual abilities of deaf children, while not definitive, suggested that the sensory deficit itself contributed to some degree of retardation in development and utilization of other sensory input. The second important possible reason these particular children display a lack of awareness of visual cues that are readily apparent to other children in the same age range is related to the lack of stimulation experienced in the home setting. Many children in these groups tend to come from low income families having few resources in time, energy or knowledge to create a favorable environment for mental growth for children with no sensory impairment, and the aurally impaired child in such a home has a double handicap. Much of the program proceeded along lines similar to those designed for other culturally disadvantaged children.

EXPERIMENTAL GROUPS:

The two classes of beginning children in the deaf department were chosen to participate in the program. The entire group of twenty-two children, eleven in each class, were divided into two experimental groups selected on a random basis within each class, but balancing as far as possible the number of children in each group from each class. One new child came in later in the fall and was added. One child who started the program was transferred to another class and eliminated. Although twenty-three were thus started, the final number remained twenty-two. The children had been assigned to classes primarily on the basis of chronological age so that all of the younger children were in one class and older children in another. Experimental Group I had six children from the older beginner group (age range 87 to 95 months as of September 1, 1966) and five from the younger class (age range 69 to 82 months). The Experimental Group II had five children from the older class (age range 88 months to 161 months) and seven children from the younger class (age range 62 months to 91 months). There was a disparity in the groups created by the changes in class enrollment after the opening of school. One child in Group I left at the completion of the training program for that group so that only four children from the younger class remained in school for the period covering the entire series of training sessions. One child who entered during the fall while the training sessions for Group I were in progress was added to Group II to begin training in several weeks. The oldest child in Group II from the older beginner class was transferred to another school program and eliminated from the training program at that time. The final composition of the two groups appears on the next page.

Table 1

Experimental Groups of Deaf Children Participating in Visual Perception Training

Class	No.	9-1-66 Group I Age Range	No.	9-1-66 Group II Age Range
Older Beginners	6	87 mos. - 95 mos.	4	90 mos. - 107 mos.
Younger Beginners	5	69 mos. - 82 mos.	7	66 mos. - 91 mos.
Total	11	Mean Age 86. 636 mos.	11	Mean Age 81.818 mos.

A total of twenty-two children completed the training program, therefore, although one child, as mentioned above, was not available for much of the subsequent testing on which some of the conclusions about the project are based.

INSTRUMENTS USED IN ASSESSING GROUPS

Tests were administered to all of the children just prior to the beginning of the training program, but in some cases no accurate appraisal of the child's ability could be obtained. Tests administered during the first week of school were the Nebraska Test of Learning Aptitude for Young Deaf Children and the Performance Scale of the Wechsler Scale for Children. Learning Ages and Performance Scores were obtained for almost every child in both groups, but in several cases the child could not cooperate well enough to attain either of these scores, and it was possible to obtain a measure for these children only at the termination of the program. In one case, however, the child in spite of repeated efforts would not respond to a testing situation although he did cooperate in the visual perception training program to a large extent. The Learning Ages and Performances Scores attained prior to the beginning of the program are shown on the next page.

Table 2

Learning Ages (Hiskey) and Performance Scores (WISC)
of Participants in the Training Program
September 1966

Group I			Group II		
Child	L.A.	Perf. Sc.	Child	L.A.	Perf. Sc.
1**			1	48	15
2	66	20	2	54	10
3	69	25	3	84	24
4	72	24	4		10
5	60	28	5	72	26
6*	36		6*	51	
7	54	16	7	54	31
8	66	43	8	54	31
9	72	31	9	54	12
10	60	30	10	48	22
11	72	40	11	78	46
Mean	62.700	28.555	Mean	59.700	22.700

*Child with severe visual handicap in addition to aural deficit which interferred with test performance.
**Child with some degree of visual impairment who also displays behavior symptomatic of emotional disturbance.

The mean differences between the two groups in age and test performance on the two tests were not significant; "t" tests were: .960 for mean difference in age; .550 for mean difference in learning age; and 1.746 for mean difference in WISC performance score.

Three children had visual impairments of some severity, but all of them were included in the training programs since it was obvious that improvement in using their residual vision would be a major contributor to their educational progress. These children could not perform adequately on the Wechsler Intelligence Scale for Children particularly if standard time limits were adhered to, since their ability to discriminate visually was quite limited. The fact that two of these children did subsequently attain scores on this test suggests that the program of training did enhance their ability to utilize their vision. The third child for whom test scores were unobtainable and for whom scores continued to be largely unobtainable has experienced major problems in adjustment both at home and in school. He was continued in the training program since in this one area he seemed to respond more positively than in any other and some improvement in response capacity was

noted. The fact that he is visually handicapped is apparent from his manner of handling materials and holding them close to one eye, but it has also been impossible to get an accurate diagnosis in this respect because of his lack of ability to respond to examiners up until this time.

In the initial planning for the project, certain group tests of visual discrimination, perception and readiness were to be given to the children immediately prior to the beginning of training for Group I. It was necessary to abandon this type of testing to a large extent because of the difficulty of communicating to the children directions for the activities required. All group testing had to be postponed until the children had had sufficient school experience to enable them to cooperate with the testing program. At the termination of Group I's training, however, the following tests were administered to all of the children and repeated again at the completion of Group II's training program:

Visual Discrimination Test (adapted from Barraga, 1964)
Development Test of Visual Perception (Frostig)

Comparisons between groups as well as between administrations of the test were made. Both the Performance Scale of the Wechsler Intelligence Scale for Children and the Nebraska Test of Learning Aptitude for Young Deaf Children were administered to all of the participating children still in the school at the end of the project.

In addition to test scores accumulated during the project, the two persons conducting the training sessions kept a record of each child's progress in each session (see Appendix for the record form) and made anecdotal records for each training session.

SEQUENCES OF TRAINING ACTIVITIES

Each child was given two individual training sessions a week for a total of twenty sessions. The first sessions with each child was terminated when he gave evidence of fatigue, but sessions could be expanded toward the later part of each child's program. Each child's attention and activity was centered on each sequence of materials as long as necessary for him to master it.

A balance needed to be maintained in giving immediate feedback and reward while not giving response cues through facial expression. Independence in response selection was encouraged, even when the child showed extreme hesitancy, but he was given immediate feedback and, if necessary help in correcting errors, once he had responded.

Materials employed which were commercially available included such items as:

1. Colored plastic shapes of circles, squares and triangles from children's toys. (Educator blocks)
2. One inch kindergarten counting cubes.
3. Nail board and colored nails.
4. Visual-Motor Perception teaching materials (Teaching Resources, Inc.)
    1. Fruit and animal puzzles
    2. Small form puzzles
    3. Large form puzzles
    4. Geometric shapes in color
    5. Configuration cards
5. Blockville Sets (Halson Products Co.)

With the blocks and nail boards we prepared design cards to be used as a pattern by the child. In addition, some material with embedded figures was mimeographed to be used in the last sessions with a few children that were ready for this activity.

Children progressed to each new activity at different rates so that some of them completed a good deal more of the program than others. The Appendix includes more complete descriptions and instructions for the various activity sequences.

The first sequence involved block patterns. Solid colored square blocks were arranged in patterns starting with a single block and progressing to patterns involving two depths of blocks in a relatively complex arrangement. The trainer demonstrated each block pattern and left it before the child as a model in the first sequence. After the child demonstrated his mastery of all the patterns with a model before him, a picture of the pattern was shown, a model constructed from the picture and then destroyed. The child then proceeded to follow the pictured pattern.

Using colored plastic blocks in triangular, circular and square shapes, the same process was followed. Children began with two block sequences in sharply contrasting colors, and proceeded with sequences up to five blocks with less color contrast. First the examiner built the pattern and the child followed his model. Next, the model was removed and the child used a picture guide. After working with horizontal arrangements, vertical arrangements were made on a center rod in the same manner.

Sequence #6 employed Large Form Puzzles (Visual-Motor Perception Teaching Materials) followed by the same puzzles in a smaller size set. The sets each contain six puzzles. Each is a square with a second square imposed diagonally on it, the inner square being printed in a color. Each square is divided into fourths to be assembled. When the child completed assembling all six puzzles, he was shown how to reverse the pieces so that the inner square was white with a colored area on the outside. This sequence was the first activity involving only two dimensional materials.

Geometric shapes in different colors were presented in Sequence#7, and the child was asked to match by shapes, ignoring color. Although no attempt was made to teach verbal responses to the child, he was told the name of each shape as it was presented and recognition was given if he verbalized the name spontaneously.

In Sequence#8, a new series of puzzles was introduced with fruit and animals in seven different series. Each series begins with the puzzle in two horizontal pieces. The number of pieces increase and the cues are progressively eliminated. For example, the first puzzles have a border and color, the next eliminate the border, and finally color is eliminated and the child works with the picture in black and white outline form.

Sequence #9 returned to the geometric shapes and the child was asked to match on two dimensions, shape and color. The next sequence (10) employed configuration cards with from one to six dots. In the first series of cards, all those with the same number of dots used the same color for the dots, the second series had all dots the same color, and the final series was in black and white. The child, starting with the first series, matched like cards. The cards were presented in number sequence but no attempt was made to teach number concepts. After matching cards in number sequence, they were again presented in random order. He followed the same matching activities with each group, the child was given a model with cards arranged from one dot to six dots in order before him and asked to arrange his cards to match. When he mastered this, the model was removed and he was given the first two cards and asked to complete the series. The single colored dot cards and the black and white dot cards were similarly presented.

In the next sequence, (11) blocks were again used, but the blocks were much more complex. They had different shapes, designs and colors. Picture models had been prepared and the child was asked to build the structures which became increasingly complex from the picture models. Care was always taken to insist on left to right orientation and completion of row one before going to row two, etc.

Sequence #12 was presented with mimeographed materials and involved recognition of embedded figures, matching of figures, etc. These were adapted from materials prepared for a training program for mental retardates by Dr. Harold Corter of the Psychology Department of North Carolina State University, who served as consultant for the project.

In the final series of activities, (Sequence #13) a nail board with colored nails was presented and the child asked to copy designs from pictured arrangements using the colored nails.

Each child progressed from one sequence of activities to the next at his own rate of speed so that not all of the children completed the same number of sequences. Below is a summary of the number of children who reached each sequence.

Table 3

Sequences Reached or Completed by Participants

Sequence	No. of Children	
	Group I	Group II
1	all	all
2	all	all
3	all	all
4	all	all
5	all	all
6	all	all
7	all	10
8	10	9
9	10	8
10	6	8
11	4	2
12	2	2
13	2	0

RESULTS

Before analyzing differences among the children in performance on the various tests, correlations were computed for the relationships existing between scores on the Wechsler Intelligence Scale for Children, Performance Scale and Learning Age as measured by the Nebraska Test of Learning Aptitude for Young Deaf Children, as well as between the WISC scores and the total weighted score for each child on the Frostig Developmental Test of Visual Perception. These are reported below:

Table 4

Correlations Between WISC Performance Scale Weighted Score, Nebraska Test of Learning Aptitude Learning Age and Total Weighted Score on the Developmental Test of Visual Perception

Tests	Pearson-Product Correlation Coefficient
WISC-Nebraska Test of Learning Aptitude (First administration of both tests)	.505*
WISC-Nebraska Test of Learning Aptitude (Second administration of both tests)	.641*
Frostig Developmental Test of Visual Perception - WISC (First administration of both tests)	.878**
Frostig Developmental Test of Visual Perception - WISC (Second administration of both tests)	.862**

*Significant at .05 level.
**Significant at .01 level.

The strong positive relationship that apparently exists between the test of perception and the performance part of the WISC suggests that perceptual abilities represent an important aspect of the child's performance on the items of the WISC that can be administered to deaf children.

Since there would be a reasonable assumption that the Nebraska Test of Learning Aptitude and the Performance Scale of the WISC would be measuring some of the same types of abilities, the relationship here would normally be anticipated, but it is also apparent that each is apparently measuring some things not covered by the other test.

TESTS OF VISUAL DISCRIMINATION AND PERCEPTION

The Visual Discrimination Test, which was adapted from Barraga (1964) who employed this test in a study of effects of visual training used with severely visually handicapped children, was administered twice. An attempt was made to administer this test at the beginning of the project, but the children were unable to comprehend directions for the test at that time, so testing was discontinued with the trial items and no scores obtained. At the end of the first twenty training sessions with Group I all children in both groups were given the test. At the end of the second training program with Group II the test was administered a second time. Table 5 indicates mean scores for the groups.

Table 5

Results of Visual Discrimination Test, Group I and Group II

	Group I Mean	Group II Mean	Difference	"t"
First Administration	10.111	3.400	6.700	2.987**
Second Administration	12.857	6.818	6.039	2.206*

**Significant at .01 level.
*Significant at .05 level.

These results suggest that Group I, the first training group, obtained an initial advantage from the training program which was retained throughout the entire period even though Group II subsequently received special training.

In comparing gains between the first and second administration of the test, Group I had a mean gain of 2.746 points (t=.837) which was not statistically significant at the .05 level. Group II had a mean gain of 3.418 on the second administration as compared with the first administration of the test. The "t" test of this gain was 1.656 which approached but did not reach the .05 level of significance.

The training program given at the beginning of the school experience of the children may have provided an initial impetus for this first group which gave them an advantage in utilizing subsequent experiences meaningfully. The second group did show a mean gain between the first and second administration of the test of slightly greater magnitude than the mean gain of Group I on the second test. Group II, however, did not attain a mean score on either test comparable with the mean score of Group I.

The Frostig Developmental Test of Visual Perception was also administered at the end of the first training session to all children in both groups and repeated with both groups at the end of Group II's training program.

This test contains five measures: Eye-Motor Coordination, II. Figure Ground, III. Form Constancy, IV. Position in Space, V. Spatial Relations. This measure was given to two groups of second year pupils at the same time as the first administration of the test to the experimental groups. Scores on the subtests for the two experimental groups were subjected to analysis of variance as shown below:

Table 6

ANOVA of Subtests of Developmental Test of Visual Perception

Sources of Variance	Degrees of Freedom	Mean Sq.	F
Among Tests	4	1829.79	8.944**
Within Tests	210	204.58	

**Significant at the .01 level.

Means in terms of perceptual age in months for the five subtests were then compared according to Multiple Range as described by Li (1966) for significant differences. Means were as follows:

V.	Spatial Relations	65.02
I.	Eye-Motor Coordination	64.35
II.	Figure Ground	55.51
III.	Form Constancy	52.39
IV.	Position in Space	51.41

The following differences were significant:

Test	Differences
V - IV	13.61
V - III	12.63
V - II	9.41
I - IV	12.94
I - III	11.96
I - II	8.84

No significant differences were found between Spatial Relations and Eye-Motor Coordination, Figure-Ground and Form Constancy, Figure-Ground and Spatial Relations or Form Constancy and Spatial Relations.

Mean gains in perceptual age in months for children in both groups between the first and second administration of the test to the children are shown for each of the subtests in Table 7.

Table 7

Mean Gains (Perceptual Age in Months) Subtests of Developmental Test of Visual Perception

Test	Mean Gain			
	Group I	"t"	Group II	"t"
I. Eye-Motor Coordination	4.00	2.789	2.45	1.490
II. Figure-Ground	5.00	2.728	.545	.455
III. Form Constancy	6.33	4.731**	3.545	1.808
IV. Position in Space	3.00	1.765	6.818	5.428**
V. Spatial Relations	14.00	9.569**	10.636	18.722**

**Significant at the .01 level.

Mean gains were of sufficient magnitude to be statistically significant for two test for each group, it can be noted from the above table. Both groups attained

relatively large mean differences on the Spatial Relations subtest; Group I, on Form Constancy; Group II on Position in Space. When, however, mean gains for both groups combined were subjected to "t" tests all of the differences were significant beyond the .01 level.

Table 8

Mean Gains (Perceptual Age in Months) Between First Administration and Second Administration for Subtests of Developmental Test of Visual Perception, Group I and Group II combined.

Test	Mean Gain	"t"
I. Eye-Motor Coordination	3.150	5.294**
II. Figure-Ground	2.550	3.515**
III. Form Constancy	4.800	7.002**
IV. Position in Space	5.100	7.163**
V. Spatial Relations	12.150	15.304**

**Significant at the .01 level.

Since a period of approximately two and one-half months elapsed between the first and second tests some of the gains would possibly be associated with normal maturation and school experience. Comparison of group means for the children in these classes and the two classes of older children who had had one year of school experience would suggest that as a group these children are more advanced than might have been possible without this special help.

Table 9

Mean Scores (Perceptual Age in Months) Developmental Test of Visual Perception, Beginning Students and Students With One Year School Experience.

Test	Mean Scores		
	Beginning Pupils		Pupils With One Year School
	1st Test	2nd Test	
I. Eye-Motor Coordination	62.045	64.950	64.80
II. Figure-Ground	54.714	58.203	56.12
III. Form Constancy	50.142	52.650	52.50
IV. Position in Space	48.857	55.650	51.93
V. Spatial Relations	58.428	69.900	65.42

Perceptual quotients were computed for the children in both groups and these are given in the following table.

Table 10

Mean Perceptual Quotients, Developmental Test of Visual Perception

	Mean Perceptual Quotient		
	Group I	Group II	Combined Groups
First Administration	68.000	64.454	66.190
Second Administration	70.667	67.910	69.150

The children were retarded in perceptual development as measured by this test both at the beginning of the program and at its completion, but there is considerable evidence of gain in this respect indicated by this test. Whether or not gains will tend to hold up during the rest of the school year with no further individual help and training will be determined by measures done with the group just before the termination of the school year. There is at least a suggestion from the experience of the children who took part in the training program at the start of the school year (Group I) that gains may be sustained through time.

MEASURES OF ACADEMIC APTITUDE, LEARNING CAPACITY

Several tests were administered to the children on an individual basis as measures of intelligence or learning aptitude. Prior to the beginning of the training program for either group, the Nebraska Test of Learning Aptitude for Young Deaf Children and the Wechsler Intelligence Scale for Children Performance Scale were employed with all of the children. These tests were given again at the conclusion of the training program for both groups. Mean scores for these tests at each administration are given in Table 11.

Table 11

Mean Scores on the Nebraska Test of Learning Aptitude and Performance Scale, Wechsler Scale for Children for Participants of Training Program.

Test and Subtest	Mean Scores					
	Group I		Group II		Combined Groups	
	1st	2nd	1st	2nd	1st	2nd
Nebraska Test Learning Age (Months)	62.700	77.333	59.700	72.273	61.200	74.550
L.A., Colored Objects	70.800	89.333	61.091	83.455	65.714	86.100
L.A., Beads	66.000	78.667	63.000	69.273	64.500	73.500
L.A., Block Pattern	57.428	74.571	51.333	64.200	54.000	68.470
L.A., Picture Identification	70.500	71.500	50.667	63.600	60.000	66.375
L.A., Paper Folding	63.000	82.000	55.200	71.400	62.210	76.400
Learning Quotient	73.700	86.333	75.200	85.545	74.450	85.900
WISC						
Performance Sc.	28.555	35.889	22.700	31.273	25.454	33.350
Picture Completion, W.S.	3.636	8.111	3.300	5.545	3.476	6.700
Picture Arrangement, W.S.	5.900	5.556	4.700	6.455	5.300	6.050
Blocks, W.S.	7.200	7.555	5.900	7.364	6.550	7.450
Object Assembly W.S.	5.500	7.375	5.500	6.273	5.500	6.737
Coding, W.S.	3.778	9.125	3.400	5.727	3.579	7.158
Performance I.Q.	70.222	80.889	63.300	74.364	66.578	77.300

An effort was made to administer five of the subtests of the Hiskey to each child twice, however, scores could not be obtained on each subtest for each child on both tests.

The number of pupils on whom a score was obtained varies with each administration of each subtest. The five subtests were: Picture Identification, Colored Objects, Bead Stringing, Paper Folding and Block Patterns.

Analysis of Variance, following the hierarchial classification or nested samples described in Li (1964) and Snedecor (1956) was done with both the Nebraska Test subtests and the subtests of the Performance Scale of the WISC.

Comparison of means among subtests (ten administered in all since two scores were available on each) was made using a one-way classification and comparisons of the two experimental groups within the subtests were analyzed. "F" tests were made according to model II or random effects model.

Degrees of freedom represented for variance in subtests is consequently nine or ten less one; for groups within test ten times groups (2) less one or ten. The error degrees of freedom is the number of observations (180) less the ten subtests times two experimental groups or twenty.

Table 12

Analysis of Variance, Nebraska Test of Learning Aptitude
First Test and Second Test

Sources of Variance	Degrees of Freedom	Mean Scores	F
Variance in Subtests	9	1.424.706	3.852*
Variance of Groups in Subtests	10	369.814	1.331
Error	160	277.410	

*Significant at the .05 level.

Using the Tukey test of differences as modified by Snedecor (1956) the gains between first and second tests in performance on the test of matching colored objects reached the .05 significance level. Differences between the first and second test administration for the other subtests did not reach the required .05 alpha level of significance. It can thus be assumed that the test of memory of colored objects accounted for much of the gain in learning age demonstrated.

Table 13 presents the analysis of variance of the subtests of WISC Performance Scale. The same nested samples or hierachial classification, using a random effects model was employed as in the Nebraska Test.

The five performance scale subtests of the Wechsler Scale for Children were administered to each child at the beginning of the program and at the conclusion, but

valid scores could not be obtained for every child on each subtest, so there is variation in the number of scores among the subtests. Since each test was given two times, the analysis of vaiance is based on the means for the subtests. Comparisons of the means of the groups within the subtests was also analyzed in the same manner as the Nebraska Test.

Table 13

Analysis of Variance, Wechsler Scale for Children Performance Scale Subtests, First and Second Tests

Sources of Variance	Degrees of Freedom	Mean Square	F
Variance in Subtests	9	38.958	3.657*
Groups in Subtests	10	10.651	1.377
Error	172	7.737	

*Significant at the .05 level.

Similarly the gains on second test administration for the WISC Performance Scale were significant, and the differences between subtests when compared according to the formula suggested above indicated that significant differences arose between first and second administration of two of the subtests. These were Picture Completion and Coding. Differences between Picture Arrangements, Block Design and Object Assembly were not statistically significant at the .05 level.

In the case of both the WISC and the Nebraska Test of Learning Aptitude, variance among the subtests was statistically significant, but not differences between groups.

Every child that could be retested in both groups experienced gains in terms of computed intelligence quotients or learning quotients on both tests of learning aptitude. During the second testing period all of the children except the one previously described could respond to the testing procedure for both tests. The mean gain in terms of I.Q. on the WISC Performance Scale was 14, and the mean increase when Learning Quotients were computed for the Nebraska Test was 13.

Subjective impressions of the two persons presenting the actual training materials and those of the teachers suggest that children made real gains in terms of alertness and sensitivity to visual impressions. As might have been anticipated, the children who showed the greatest improvement were those with better capacity when measured by tests and rated by teachers, however, even the children who continue to be retarded in classroom performance are more alert to many visual cues. In the one case where the child would not respond to the testing situation, notes from the training sessions indicate a degree of cooperation during many of the sessions that was superior to his performance in the classroom. Within the classroom, however, he has responded to the extent that he will follow simple directions and engage in some group activities. In the cases of the other two children with visual impairments there is evidence of decidedly better ability to discriminate materials that are brought within their sight range of which they would previously have not been able to do.

All of the gains evidenced both in test performance and more subjective observations cannot, of course, be attributed to the activities involved in the training program since the regular school provides a great deal of experience and stimulation which few of the children had previously been exposed to, but the assumption can probably be made that students who experienced the training period are better able to utilize new experience for growth and development than before experiencing the visual training program.

SUMMARY AND CONCLUSIONS

Twenty-two children enrolled in the beginning classes at The Governor Morehead School department for the deaf were divided into two experimental groups at the beginning of the school year to participate in a program of visual training. Eleven children were given twenty individual training sessions designed to enhance visual perception during the first ten weeks of school, and the second group of eleven was exposed to the same training program during the following weeks.

Tests of academic aptitude including the Performance Scale of the Wechsler Intelligence Scale for Children and the Nebraska Test of Learning Aptitude for Young Deaf Children were administered both at the beginning and the end of the training program. Gains which attained statistical significance were evidenced on both measures between pre and post-testing. The subtest which contributed the greatest gain on the Nebraska Tests was Colored Objects, and on the Performance Scale of the WISC the two subtests on which greatest gains were shown were Picture Completion and Coding.

On visual perception tests, Group I (who experienced the earlier training program) attained better scores on the first tests administered immediately following their training sessions. Group II showed somewhat larger gains in scores on these tests when results of the first tests and the second tests given at the termination of the training program for this group were compared, but Group II did not attain as high scores on either of the tests as did Group I. When the results of both groups were combined gains which were of sufficient magnitude to be considered significant statistically at or beyond the .05 level were noted on the Visual Discrimination Test and on all of the subtests of the Developmental Test of Visual Perception. Means for the entire group were close to means for a group of older children who had had one year of school experience and who took the test at the same time as the first test was administered to the experimental groups.

Increased awareness of visual cues on objective measures of academic aptitude or learning capacity resulted in the higher scores obtained on these when they were administered at the conclusion of the training project.

As would be anticipated, the children did perform better on tests of visual discrimination and perception. The fact that the mean scores on the perception tests of

the two Experimental Groups equalled or exceeded the means for two groups of pupils who had entered school the previous year suggests that the training program provided an advantage to the beginners in the skills thus measured.

Subjective impressions of persons working closely with the children and experienced in work with similar groups of deaf children in the past would indicate better capacity to employ visual cues meaningfully in their educational development since completion of the program. These impressions are not, of course, capable of qualification or statistical analysis. They carry certain validity in that they are based on experience and long acquaintance with children of similar background.

The initial conclusion would be that in addition to measurable gains on certain standardized measures, there has been some observable carry over into day-to-day classroom activity.

Further tests are projected for later in the school year to determine whether gains experienced as a result of training will be sustained during the months that follow when no special individual visual perception training is provided.

Since the education of the deaf child necessarily depends to such a large extent on visual alertness, and since the child must employ vision both as his primary distance sense as well as utilize it in the more restricted near environment, much of his growth and development depends on effective utilization of vision. Training procedures that increase his visual perception may lessen the time needed to establish verbal skills so that effects will be cumulative.

Ideally, the deaf child's experiences in his home during the pre-school years should provide much visual perception training, but many children such as the particular group under study who have an aural handicap that necessarily limits their sensory intake in one channel, experience a further disadvantage in that the home environment cannot supply the necessary compensatory training. With these children, time spent in the first weeks of their educational experience in creating greater capacity to employ vision more efficiently will enable them to progress more rapidly and experience greater educational growth.

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APPENDIX
Section I

RECORD FORM OF CHILD'S RESPONSE ON EACH DAY OF TRAINING.

CHILD'S NAME_____BIRTHDATE_____

TEACHER_____EXPERIMENT GROUP No.___

BLOCK MODELS SEQUENCE #1 - DATE - COMMENTS	SEQUENCE # - DATE -COMMENTS
1. 2. 3.	4. 5. 6. 7. 8. 9. ....
BLOCK PICTURES SEQUENCE #2 - DATE - COMMENTS	
1. 2. 3.	
PLASTIC BLOCK (COLORED) SEQUENCE #3 - DATE - COMMENTS	
1. 2. 3.	
PLASTIC BLOCK SEQUENCE #4 - DATE - COMMENTS	
1. 2. 3.	
PLASTIC PICTURES SEQUENCE #5 - DATE - COMMENTS	
1. 2. 3.	

Section 2

INSTRUCTIONS FOR THIRTEEN SEQUENCES OF VISUAL PERCEPTION TRAINING ACTIVITIES WITH SAMPLE ITEMS FROM EACH.

INSTRUCTIONS TO PERSONS CONDUCTING TAAINING SECTIONS.

Sequence No. 1 and Sequence No. 2

Seat the child comfortably, facing you.

Introduce plain, solid colored blocks to the child. Demonstrate that the blocks are the same on all sides by turning them. Place the blocks at random in a box and put it at a convenient distance for him to reach them.

Put out one block. Indicate by gesture the child is to put out a block to match it. Point to your block, point to a place in front of the child, then point to the box of blocks. If he has difficulty grasping what you want him to do, guide his hand toward the blocks in the box, select one with his hand and place it at the spot you had designated. Smile and indicate approval by saying "Good" or gesturing as if to clap your hands.

Repeat the process after returning blocks to the pile. Continue to do this until he seems sure that he knows what you want.

Put two blocks side by side, picking them up one at the time, and gesture as before. Be sure to put them in left to right order. Insist that he place them in the designated place in left-right order. Guide his hand until he understands. Indicate approval and pleasure for each correct placement even if you have to guide his hand. If he does it incorrectly, shake your head and guide him through it again.

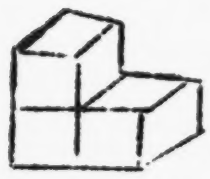
Next place three blocks before him in the same manner. Follow the same procedure, always being sure both of you put the blocks in left to right order for him.

After he has placed the three blocks, build a pattern of three blocks into a bridge and have him repeat.

When he has mastered this, proceed with the following simple block patterns. Build your pattern, then have him build his until he can successfully complete it in left to right order. Always leave yours before him as a model.

SAMPLE: Block patterns to be reproduced first from models (Sequence #1) and then from pictures (Sequence #2)

1.



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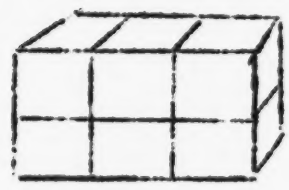

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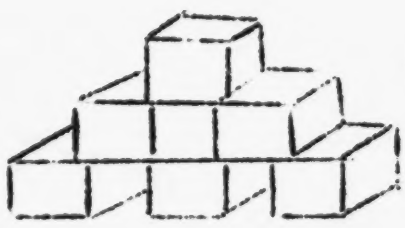

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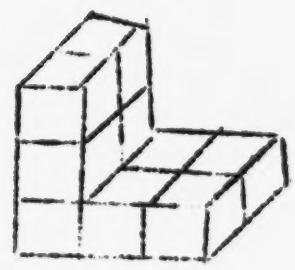

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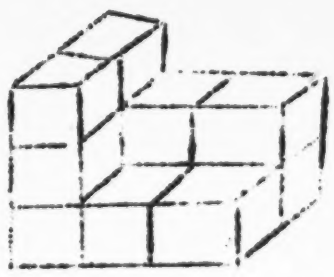


Use of the picture models enabled the child to grasp the concept of possible hidden blocks that must be filled in before the structure could be completed.

When he has completed all the block patterns from a model, start with a brief review of the last several patterns.

Introduce a picture of a pattern to be built. Follow the same patterns he used the previous sessions, but this time in picture form without your model to go by. Start by showing him the picture of the bridge. Build it: destroy your model and hand him the blocks.

Work with each pattern until he understands, being sure he follows left to right orientation, completes the first row before going to the second, and the second before proceeding to the third row. This last may be somewhat more difficult for him to understand, but insist on this procedure since we are concerned with establishing a regular sequence that has some relationship to reading eye sequence movements.

SEQUENCE #3 - PLASTIC BLOCKS (COLORED)

Introduce objects of different shape (Educator Plastic Blocks). Place the blocks before the child in the sequence shown. Demonstrate the first groups as you introduce the picture.

The large, bright colored plastic blocks shaped in circles, squares, and pie shaped wedges were arranged in sequences, starting with two blocks of different shapes and sharply contrasting colors. The sequences increased up to five shapes at one time, and the colors were repeated in different shapes and more closely related colors used.

Sample block sequences:

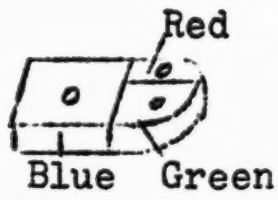
1. red square, purple circle
5. purple square, blue circle, green circle
9. blue wedge, yellow circle, green wedge
21. red circle, yellow square, red wedge
23. green wedge, purple circle, purple square, green circle
35. green circle, red circle, yellow wedge purple square, red square
37. green wedge, yellow circle, purple circle, yellow square, green square
39. green square, blue wedge, purple circle, purple square, blue circle

SEQUENCE #4 - PLASTIC BLOCKS

The same plastic blocks were employed. The child was introduced to simple patterns which the examiner built following the pictured model and then left in tact as he

reproduced the same pattern. Ten designs were employed increasing from three blocks of different shape to a tower of four blocks on a stick. As many as eleven blocks were employed in one design. Sample designs are reproduced below.

1.



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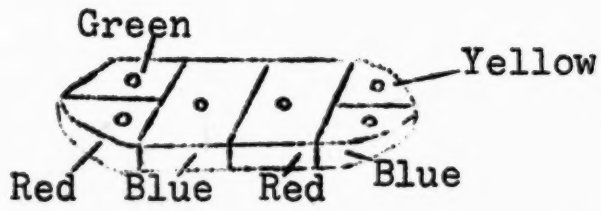

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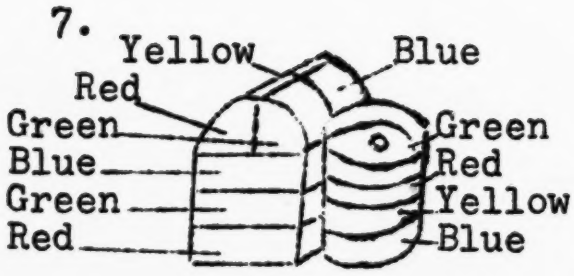

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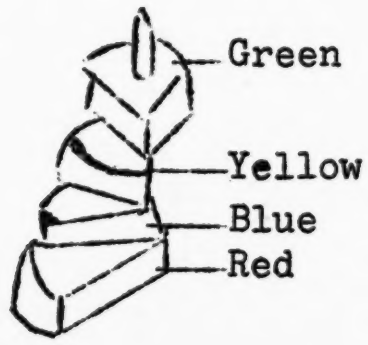

SEQUENCE #5 -- PLASTIC BLOCK PATTERNS REPRODUCED FROM PICTURES

Sequence #5 is the same procedure as Sequence #4 except for working with pictures instead of models.

SEQUENCE #6 -- LARGE AND SMALL FORM PUZZLES
(Visual-Motor Perception Teaching Materials, Teaching Resources, Inc.)

This set contains six puzzles; each is square with a second square superimposed diagonally. The center square is printed in a primary or complementary color on a white background. Each 4" x 4" square is cut in half, vertically and horizontally. When the four parts of the puzzle are assembled, the center of each forms a square. The four pieces are reversible.

Directions: (Use large puzzles first, then small ones) Place pieces of one puzzle before the child. Assemble

the pieces to demonstrate. Mix the pieces up and place them before the child again. Indicate by gesture he is to assemble them. Show approval when he succeeds. Place the next puzzle before him and gesture for him to complete them. Repeat through series. As he completes each puzzle, move it in completed state away, but leave it visible. Now take the last puzzle he has completed. Turn each piece around and let him watch you reverse the puzzle so the center square is white and the background is colored. Indicate that the child should do this with the next to last one completed. Go back through the series reversing each.

SEQUENCE #7 -- GEOMETRIC SHAPES
(Visual-Motor Perception Teaching Materials, Teaching Resources, Inc.)

Geometric shapes, six true colors, to help teach child in matching and recognition of colors, and assist him in discriminating and identifying shapes. Geometric shapes represented by the cards include a circle, square, rectangle, hexagon, triangle, and diamond. Each shape is in the following six colors: red, blue, yellow, green, orange, and purple. The persons doing the training were instructed to say the name of each form each time on presenting it, but not to expect the child to repeat it although some try. The term "ball" was used for round. The only purpose of saying the word was to give the child the visual experience of watching the lip movements.

Directions: Shape matching first:

(a) Place each shape before the child in turn. Then put them down on the table in random order. Put all of the shapes out on the table.
(b) Pick up one shape (ball, square, triangle, rectangle, diamond, hexagon in that order through the series). Place it before the child. Pick up another just like it, smile, put it on top of the first. Motion the child to finish piling the cards of the shape together.

SEQUENCE #9 -- GEOMETRIC SHAPES AND COLORS

Using the materials of Sequence #7, examiners were told to pick up a colored shape, then choose another shape of the same color. Place them side by side. Guide the child's hand to another card of the same color. Allow him to work independently.

Choose a shape and then carefully select another card of the same shape and color. Assemble all objects of the same shape and color together. Give the child another shape of the same color and gesture that he is to follow your example with that shape.

When he completes this one, proceed to a different color, continuing the same shape.

SEQUENCE #8 -- FRUIT AND ANIMAL PUZZLES
(Visual-Motor Perception Materials,
Teaching Resources, Inc.)

There are six puzzles in a set. Each puzzle gradually increases in difficulty by deletion of the borders and use of less stimulating colors. There are seven sets in the group.

Directions: Show the child the first picture in the set -- the uncut or whole picture. This allows the child to recognize the puzzle as it will look when he has completely assembled it. Place the pieces of one puzzle before the child in the sequence described below. Ask him to assemble the puzzle so that it is the same as the picture he has just been shown. Note that each whole puzzle picture has five accompanying puzzles. They are designed to help establish the following patterns:

The second puzzle is cut vertically into two pieces.
The third puzzle is cut horizontally into three pieces.
The fourth puzzle is cut vertically and horizontally into four pieces.
The fifth puzzle is cut in the same way as the fourth, but the border is missing.
The sixth puzzle is cut horizontally into three pieces. All color clues are deleted.

The child should complete each of the above steps successfully in all seven puzzle subjects before he advances to the next sequential step.

SEQUENCE #10 -- CONFIGURATION CARDS
(Visual-Motor Perception Teaching Materials,
Teaching Resources, Inc.)

Three sets of cards with one to six dots are presented in three ways. One set is color-cued, the second set is in one color; the third set is black and white. Each set contains thirty-six cards.

Directions: Start with Set 1, place the cards on the table in random order.

(a) First demonstrate by taking up the "1" card. Place in front of the child. Find another "1" card and place before the child to the right of the first. Indicate by gesture he is to pick out the others and place them similarly. When completed pick up the "1's" and distribute randomly. If on the "1" the child has difficulty, take up all but one other number of dots -- i.e. the three's so the selection process is easier.

(b) Proceed with the two dot card by placing before him and indicate he is to do the same thing. Correct any errors quickly. Collect and distribute cards again each time.

(c) Continue through the numbers.

(d) After going through the cards in 1, 2, 3, and etc. order, go through in random order.

Go through the sets 2 and 3 in the same manner. When the child has accomplished this, return to Set 1 and demonstrate sequence 1, 2, 3, etc. in left to right sequence. Allow child to imitate. Correct errors instantly. Take away the model and see if he can complete the sequence after you place the first two before him. Follow the same sequence with Sets 2 and 3.

SEQUENCE #11 -- BLOCKVILLE PATTERNS

Blocks are of different shapes, having both triangular and square blocks. All of the triangular blocks are blue, but the other blocks contain designs of different colors. Sizes of the blocks have either red or blue brick patterns on them. Some blocks contain yellow or brown patterns somewhat resembling trees; others have blue or red window and door patterns. A number of structures of increasing degrees of complexity may be constructed with these. Thirteen designs were prepared for this particular series.

Directions: First illustrate each different kind of block shape and pattern to the child, then present the first picture design to him. Demonstrate the placement of blocks to create this design, and then allow him to copy it. Guide him in selecting the correct blocks and assist in placing them correctly to form the structure initially. Allow him then to complete the design independently.

After the first few structures encourage him to work directly from the picture to reproduce the designs.

SAMPLE DESIGNS:

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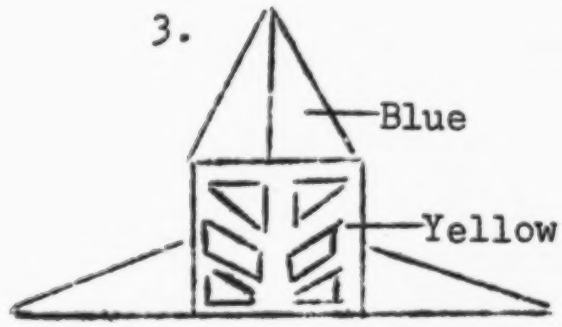
3.



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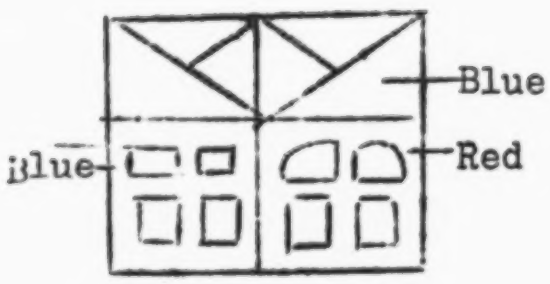

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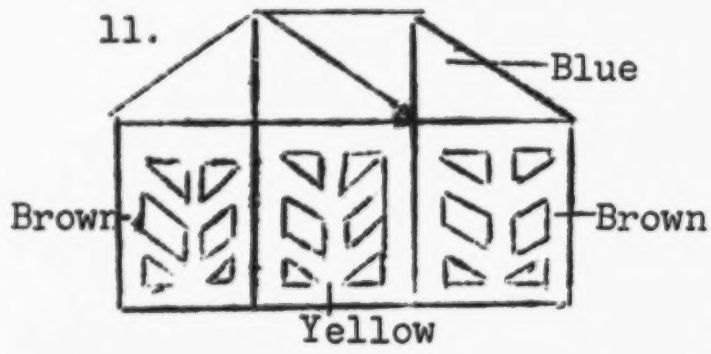

SEQUENCE #12 -- EMBEDDED FIGURES

Mimeographed materials were prepared and the child used pencils in outlining or indicating choices on the sheets.

In the first series, a square, a circle and a triangle, are shown and beneath them these figures arranged in a complex design with overlapping figures. The child outlines each figure in turn.

In the next activity, a model is shown and a series of different multiple choice items are lined up beside it. The child is instructed to choose the one like the model. This becomes increasingly complex and the item like the model is embedded in another design.

The next series requires that the child choose the item that is the reverse of the model from among the multiple-choice figures, and the final series asked that he find the model figure in complex multiple-choice figures.

The materials employed in this part of the training program were adapted from items prepared for another project by Dr. Harold Corter of the Psychology Department of North Carolina State University and used with his permission. They are not, however, illustrated here since they will be published subsequently in another publication.

SEQUENCE #13 -- NAIL BOARD DESIGNS

The nail board which consisted of a masonite board with perforations mounted on a solid board allowed small nails with large heads painted in various colors to be inserted to form designs. There were 100 perforations arranged in rows of ten.

The child was shown the materials, and the method of inserting the nails to form a design illustrated. Design cards were prepared starting with easy two color arrangements of nails and progressing to multi-color designs of a more complex nature. Fourteen designs were prepared.

Sample types of designs wre shown below:

1. Row of ten nails, with a red nail on either end and green nails in the eight center positions.

2. Straight row of ten nails in the following color sequence: green, white, blue, yellow, red, green, white, yellow, blue, red, green, white.

5. Second row of nail board, ten yellow nails; fourth row, four green nails; sixth row, ten blue nails; eighth row, four white nails; tenth row, ten orange nails.

7. Two diagonals with a white center nail, one arm blue; one, yellow; one red and one orange.

8. A six formed with blue nails.

13. Interlocking blue and orange squares.

14. Interlocking squares with mixed colors (blue, red, yellow, green).